ARIZONA DEPARTMENT OF TRANSPORTATION

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RURAL HIGHWAY MAYDAY DEPLOYMENT PLAN

Final Report

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16. Abstract

This Arizona Department of Transportation (ADOT) study focused upon the application of Mayday strategies to meet emergency response challenges along the US 93 corridor in Northwest Arizona. This route was chosen due to its history of accidents, remote location, topography, and the need for enhanced communications on this busy North American Free Trade Agreement (NAFTA) corridor. The project was championed by the ADOT District Engineer due to concerns for traveler safety and lack of consistent communications throughout the corridor.

Due to the lack of consistent communications availability on US 93, automated in-vehicle technologies along with their costs were not deemed practical at this time. The project focused on mass market accessibility so that all travelers on the corridor would have access to whatever implementation was recommended. A diverse approach to accident identification and notification was developed, arriving at a recommendation for three TAC and stakeholder-defined projects:

- Motorist Assistance Patrol
- Emergency Telephones
- Commercial Vehicle Operations (CVO) Corridor Watch Program

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
ml	miles	1.61	kilometers	km
	AREA			
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
	VOLUME			
ft oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3

NOTE: Volumes greater than 1000 L shall be shown in m^3.

	MASS			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
m^2	meters squared	1.19	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
	VOLUME			
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.31	cubic yards	yd^3

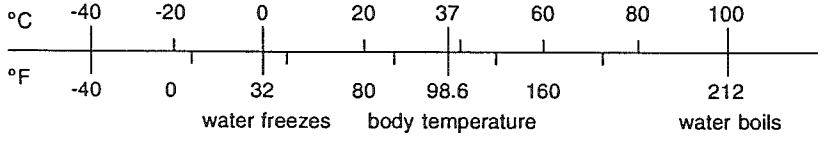
	MASS			
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T

TEMPERATURE (exact)

Symbol	When You Know	Do The Following	To Find	Symbol
°F	Fahrenheit temperature	°F - 32 ÷ 1.8	Celcius temperature	°C

TEMPERATURE (exact)

Symbol	When You Know	Do The Following	To Find	Symbol
°C	Celcius temperature	°C x 1.8 + 32	Fahrenheit temperature	°F



METER: a little longer than a yard (about 1.1 yards)
LITER: a little larger than a quart (about 1.06 quarts)
GRAM: a little more than the weight of a paper clip
MILLIMETER: diameter of a paper clip wire
KILOMETER: somewhat further than 1/2 mile (about 0.6 mile)

*SI is the symbol for the International System of Measurement

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

This Rural Mayday Final Report presents an overview of the U.S. 93 Corridor Mayday research project, along with its resulting recommendations.

This Arizona Department of Transportation (ADOT) study focused upon the application of Mayday strategies to meet emergency response challenges along the US 93 corridor in Northwest Arizona. This area is located within the ADOT Kingman District. The study involved key stakeholders throughout the corridor, who collectively made up the Mayday Technical Advisory Committee (TAC). Detailed information on specific components of the project is contained in a series of six detailed technical memorandums available from the ADOT Transportation Research Center (ATRC). This Mayday Final Report includes term definitions, project background, the approach utilized, and the final project recommendations.

1.1 PROBLEM STATEMENT

The US 93 corridor between Wickenburg and Hoover Dam was selected to research the opportunity for Mayday technology implementation (see maps, pp. 13 and 18). This route was chosen due to its history of accidents, remote location, topography, and the need for enhanced communications on this busy North American Free Trade Agreement (NAFTA) corridor. The project was championed by the ADOT District Engineer due to concerns for traveler safety and lack of consistent reliable communications throughout the corridor.

Because of the highway corridor characteristics such as traffic volume, traffic mix, roadway geometrics, terrain considerations and communications challenges, it was determined that US 93 would be a good candidate for alternative traffic safety implementations. The identification of this corridor for Mayday research led to the development of a plan that would benefit the traveling public throughout Arizona in rural or urban areas.

Upon direction by the Mayday TAC, this project focused on emergency response solutions that do not require technology investment by individual motorists. The emphasis was on providing the greatest benefit to the most highway users. Given several alternatives for consideration, the Mayday TAC chose to pursue a three-pronged approach to enhance incident identification and notification: a motorist service patrol; a public/private partnership CVO Corridor Watch program; and emergency satellite telephone installations at key locations. The following sections describe the project background, approach, and resulting recommendations.

2. BACKGROUND

Average daily traffic (ADT) counts on US 93 show numbers that range from a low of 4,000 to a high of 19,300. The route itself is heavily used by tourists as well as tour buses on their way to casinos and other venues. US 93 is also a NAFTA designated corridor, which brings significant commercial vehicle traffic to it as well. At least 10% of the traffic can be commercial vehicles on any given day. Complicating travel for the high number of vehicles on this corridor, the roadway geometric design is outdated, there are overall design deficiencies on the shoulders and guardrail, and given the terrain, the roadway consists of numerous curves creating poor sight distance challenges.

The consequence of all these factors often will be tired, unfamiliar, and in many cases, first-time US 93 drivers on a narrow, winding remote rural highway. It is unlikely that many of these travelers would be able to describe their location to emergency personnel, much less relay an accurate request for assistance, given that the aftermath of an accident severely impairs an individual's ability to assess and describe the situation.

US 93 Accident History Data, SR 71 – I-40 (milepost 182 - 91)				
Year	**Total Accidents**	**Number of Vehicles Involved**	**People Injured**	**Number of Fatalities**
1995	396	573	234	12
1996	326	482	208	17
1997	365	528	257	10
TOTAL	**1,087**	**1583**	**699**	**39**
Of these 1,087 accidents, nearly two-thirds of them occurred between the hours of 7:00 in the morning and 7:00 at night				

Table 1. US 93 Accident History Data

As shown in Table 1, US 93 travelers experience numerous incidents and accidents. Over 70% of these accidents involve travelers either leaving the roadway, hitting objects or animals, or experiencing rear-end or sideswipe collisions, or rollovers. The nature of the travel on US 93, the incidents and accidents that occur there, and the profile of the travelers that use it themselves, collectively posed a unique set of challenges to the emergency response providers responsible for assisting motorists along this stretch of roadway. As a result, response providers find themselves constantly battling the "golden hour" of time that is the target for delivering victims to proper hospital facilities.

Essentially, three time factors are relevant:

1. The time it takes stranded or injured travelers to establish communications with a public safety answering point (PSAP), and relay a request for help.

2. The time it takes dispatchers and response personnel to learn the location, nature of injuries, and number of victims involved, either from the motorist involved or by other means.

3. The time it takes for response personnel to reach the motorist with the proper equipment (i.e. prepared to treat and transport all victims appropriately).

Emergency response times associated with the three time factors average 52.4 minutes in rural environments, and 34.9 minutes in urban environments. With passage of the "golden hour" often literally making the difference between life and death, it is no surprise that a number of public agencies are advancing their mission of ensuring the safety of the traveling public by considering deployment of Mayday systems. If planned for and implemented properly, these systems can significantly help reduce the time required for the appropriate personnel with the proper equipment to reach victims of motor vehicle accidents, breakdowns or other incidents.

The need for Mayday systems has been expressed in a number of user needs surveys throughout the U.S. as well as within Arizona. As part of the I-40 Early Deployment Plan, market packages were identified to address the needs of Northern Arizona travelers. One conclusion of this study showed that emergency response and Mayday support were critical areas to be pursued as both short and medium term deployments. Other similar rural needs assessments conducted throughout the U.S. have all identified emergency services support for stranded or injured travelers (Mayday) as one of the leading safety related issues.

During the course of this research project, records kept on US 93 by the Department of Public Safety and ADOT show that approximately 100 accidents and over 1,300 motorist assist calls were recorded in an eight month period.

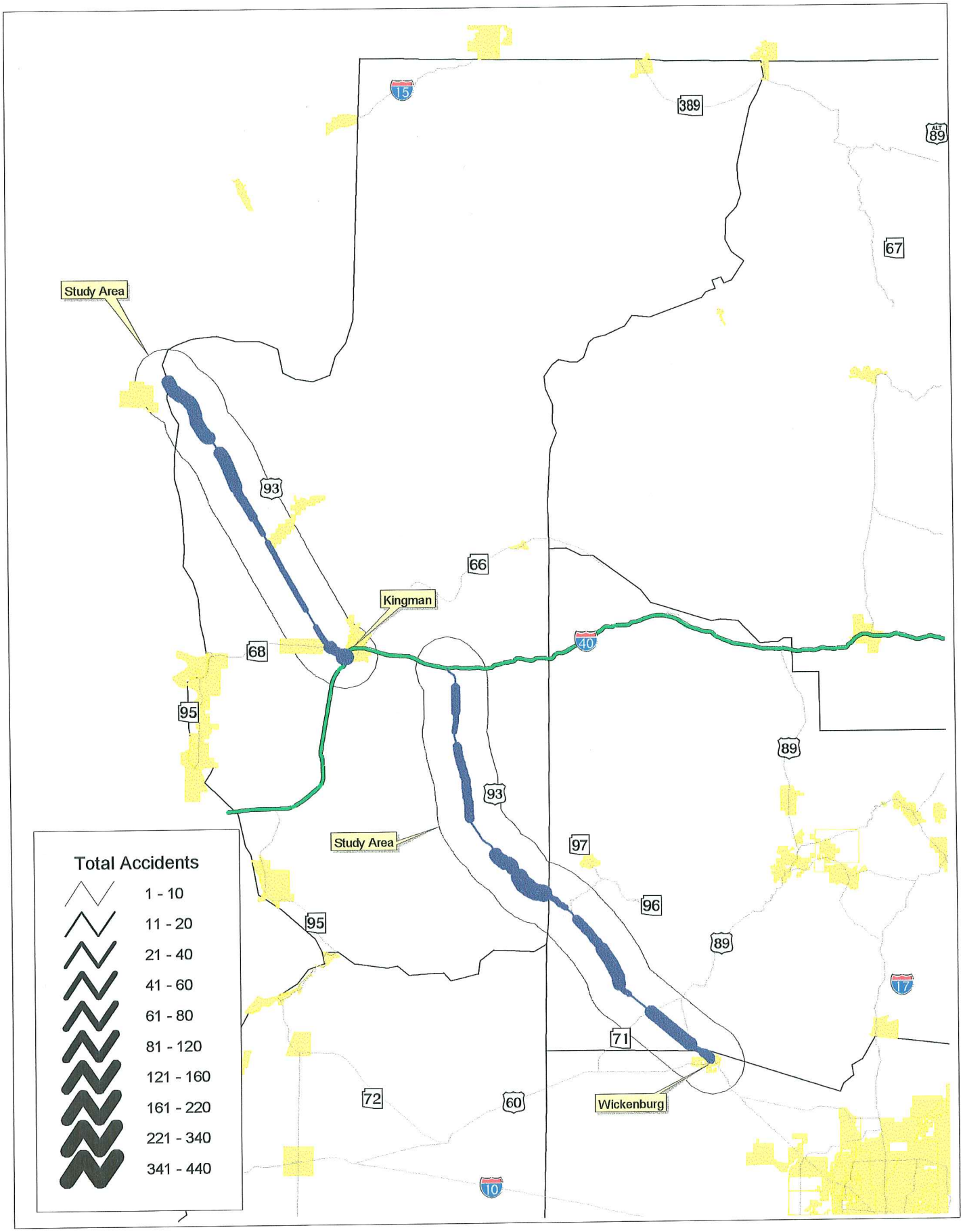


Figure 1
Total Accidents on U.S. 93 (1994-1996)

2.1 DEFINITIONS

Mayday vs. Emergency Response. These definitions are provided to explain that while this ADOT project initially carried out a rural Mayday technology study, the final project recommendations largely reflect Emergency Response enhancements, which is what the stakeholders and the corridor analysis have indicated is most critically needed on US 93. The definitions were taken from the National ITS Architecture implementation document and are as follows:

- ***Mayday Support*** systems require a "portable traveler interface and interactive, wide area wireless communications between the traveler and the infrastructure". This portable traveler interface and interactive communications capabilities can be leveraged to support other traveler information capabilities addressed by the Interactive Traveler Information market package. This progression towards Mayday reflects likely scenarios in which the consumer is motivated by the potential for enhanced safety, installs the equipment, and then becomes part of a larger market for more advanced interactive information services.

- ***Emergency Response*** systems enable "rapid response" to the emergency notification systems provided by the Mayday Support, Transit Security, and Incident Management System market packages. The Emergency Routing market packages provides the basic dispatcher support capabilities which may be extended and integrated to support the required multi-agency coordination supported by the Emergency Response market package.

The term "Mayday" was first utilized in the intelligent transportation system (ITS) industry by manufacturers wishing to integrate a number of technologies including:

- crash detection sensors,
- vehicle computer/performance monitoring and control functions,
- in-vehicle route guidance/navigation sensors (global positioning systems [GPS]),
- vehicle information systems, and
- cellular telephones with digital modems providing an automated Mayday report upon vehicle impact or mechanical problem.

This integrated accident notification (either by manual trigger or crash detection), in-vehicle positioning systems, and wireless communications (typically via cellular telephones) relay information to the appropriate emergency response personnel.

The premise behind Mayday is to reduce the time required by the emergency service providers to reach motorists in trouble. The concept of Mayday, in the strictest sense, requires in-vehicle sensors, communications, and a GPS unit integrated with an on-board processor to transmit digital messages to a PSAP via an integral transceiver, providing information about the vehicle's identification, location, and the nature of the accident.

In summary, strictly traditional Mayday is defined by the use of in-vehicle GPS, and cellular communications capabilities, while emergency response concepts can include any combination of roadside infrastructure or other methodologies for enhanced notification and response. This Mayday project involved emergency management professionals and addressed their real-world, present day emergency response challenges through the resulting practical project recommendations.

3. MAYDAY PROJECT OVERVIEW

The Mayday project was conceived by the ADOT Kingman District Engineer and was supported by the Operations Manager for the Arizona Statewide Traffic Operations Center. In October, 1997, the Mayday concept was submitted for priority rating to the ADOT ITS Emphasis Area Workshop members. The project was selected and forwarded to the ADOT Research Council for approval. The project was approved in early 1998 and an initial Technical Advisory Committee (TAC) was formed to develop a project scope of work for inclusion in a Request for Proposal (RFP).

The Mayday project was bid in July, 1998, with the TAC reviewing proposals and selecting a multi-faceted team to complete the research. The team was led by Castle Rock Consultants, supported by Lee Engineering and Kimley-Horn and Associates. The notice to proceed was issued in September, 1998 and a full TAC was formed to oversee the progress of the project. The TAC is made up of statewide and local agencies that operate along the corridor, including the following representatives:

- state / local law enforcement agencies
- transportation agencies
- emergency management organizations
- state 9-1-1 office
- medical service response providers
- state automotive association
- state towing association
- Federal Highway Administration
- ADOT maintenance, construction, and traffic operations center staff

The Mayday project had a kick-off workshop with US 93 corridor stakeholders to discuss issues and brainstorm on solutions. The interaction provided the basis for the User Needs technical memorandum and revealed a broad set of challenges to be addressed by any recommendations that resulted from this project. The industry technical review and corridor research provided a basis for Mayday implementation recommendations. As the project progressed the initial study limits of SR 71 (Wickenburg) to the Nevada border were refined to focus on the corridor area with the greatest need for improvements, resulting in new project limits of SR 71 to Kingman.

The consultant initially developed a three-tiered alternative listing that provided project opportunities at cost levels ranging from high-end to low-end possibilities. Fully automated systems were reviewed while considering individual traveler and agency objectives for increased safety along the corridor. Due to the lack of consistent communications availability on US 93, automated in-vehicle technologies along with their costs were not deemed practical at this time. The consultant team, under the

direction of the TAC, focused on mass market accessibility so that all travelers on the corridor would have access to whatever implementation was recommended. As the corridor needs crystallized, and cost constraints were identified, a diverse approach to accident identification and notification was developed, arriving at a recommendation for three TAC and stakeholder-defined projects:

- Motorist Assistance Patrol
- Commercial Vehicle Operations (CVO) Corridor Watch Program
- Emergency Telephones

These recommendations are discussed in detail in Section 5 of this report.

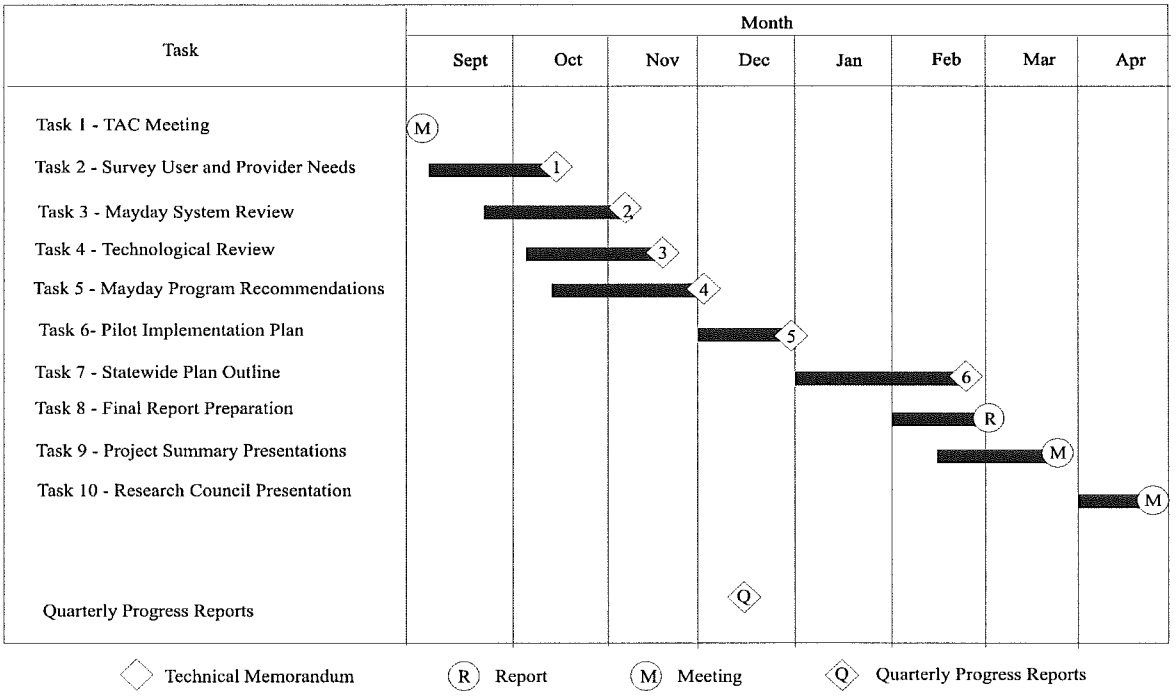
The TAC meetings were held monthly throughout the project planning process to update the committee and obtain their input on every technical memorandum, as well as provide project guidance.

Concurrent with the final tasks of the project in early 1999, several presentations were scheduled by the research team and TAC to brief various agencies on the project recommendations. Presentation audiences include the ADOT Research Council, and executive administration within ADOT and the Department of Public Safety. Also, a follow-up workshop was scheduled at the end of the project that briefed corridor stakeholders on the Mayday recommendations. A detailed review of the tasks and activities of this rural Mayday project is provided in the following section.

4. RESEARCH PROJECT APPROACH

The Mayday project consisted of 10 distinct research tasks that provided a comprehensive coverage of issues, allowing each task to build upon the previous data gathered. The original timeline for the Mayday project tasks is included to illustrate the timeframe and sequencing of each task. The individual tasks are also described in detail in the pages following this project timeline.

Table 2. Project Schedule



Project Schedule

4.1 PROJECT WORKSCOPE TASKS

Task 1 Technical Advisory Committee (TAC) Introductory Meeting
The Mayday TAC gathered to approve the consultant's project approach and scope, and to provide their agencies' perspectives to this planning process. This first meeting reviewed the proposed method for identifying the existing and future needs for Mayday Systems along the U.S. 93 corridor, and determined specific project expectations. This initial meeting ensured that the proposed approach met the needs of the Arizona ATRC and the US 93 corridor community. As part of the project initiation process, consultant team representatives met with national Advanced Rural Transportation System (ARTS) program representatives to ensure that the Mayday project recommendations would be consistent with national as well as local goals and activities.

Task 2 Survey Highway Users and Emergency Service Providers
The purpose of Task 2 was to develop an understanding of the needs, responsibilities and coordination issues of the user communities along the US 93 corridor, in order to ensure that any Mayday application that results will improve the situation for all parties involved. To accomplish this, a qualitative and quantitative needs assessment was performed. The quantitative needs analysis consisted of a review and synthesis of rural user needs analyses throughout the United States to provide an understanding of the needs likely to be concerns along the corridor. Using this information as background, the project team reviewed traffic and accident statistics specific to the US 93 corridor to develop a complete understanding of the local experiences. Members of the project team also obtained results from the recent US 93 Safety research project. The results of the quantitative needs analysis formed the basis for preparing for the qualitative analysis.

The qualitative needs analysis utilized the background material assembled in the first task activity to prepare for and conduct a corridor stakeholder workshop in Kingman. This workshop brought together as complete a group of transportation and emergency service professionals as possible. The intent of the workshop was to understand the challenges and needs that face the corridor professionals on a daily basis, and to understand the needs of travelers that are specific to this corridor. The group meeting attracted approximately 75 attendees from a large geographic area along the corridor for a broad perspective of corridor challenges. Follow-up discussions via a series of facsimile surveys and limited follow-up telephone calls with agencies throughout the corridor were held to incorporate input from key corridor users that were unable to attend the workshop.

Task 3 Mayday Systems Review
The National ITS industry has executed a large number of operational tests to demonstrate and evaluate various technologies and approaches. The experiences of these tests have documented valuable lessons learned to be shared with other similar deployments. This task encompassed reviewing Mayday experiences of other Departments of Transportation (DOT) and Departments of Public Safety in order to document approaches and options for the US 93 study. In this task, nationwide Mayday-

related activities were documented, as well as the local situations that influenced the direction of each project.

Public sector project managers in each major Mayday operational test were contacted and a Multi-Jurisdictional Mayday (MJM) team presented project status and findings to the ADOT Mayday TAC. This task's efforts were dedicated towards assembling documentation from these projects and communicating with the key contacts in each operational test in order to verify and update information.

Task 4 Technology Review

This task reviewed available and emerging technologies likely to have an impact on Mayday deployment along US 93 in order to present the TAC with a state-of-the-art summary of technology options. Cellular and satellite communications were among the concepts reviewed to determine the best options for implementation along the corridor.

Task 5 Mayday Program Recommendations

Task 5 was a culmination of the users needs, lessons learned from other Mayday projects, and available technologies to provide recommendations that are most appropriate for the US 93 Corridor, and that offer the highest likelihood for success. Several options at differing levels of cost were presented to the TAC, from high-end in-vehicle systems downward. The intent was to provide and balance several levels of individual traveler cost with agency/infrastructure cost. With further refinement, a three-tiered conceptual cost package of high, medium and low cost projects, was presented with focused recommendations that met the TAC's vision and the highway users needs for a Mayday deployment on US 93. The TAC chose a combination of three recommendations that would meet most of the motorists needs and resolve some of the challenges along the corridor.

A three-pronged alternative was selected that consists of:

- A Motorist Assistance Patrol;
- A CVO Corridor Watch Program; and
- Emergency Satellite Telephones.

The TAC recognized that implementation of such a project would require support from a number of local agencies along the corridor, so their consensus to these recommendations was critical and the first step towards implementation. These recommendations were selected because they best met many of the agency's and the public's stated needs regarding traveler safety on the corridor.

Task 6 Mayday Pilot Implementation Plan

This task made use of the information assembled in tasks 2 through 5 to develop the Mayday Pilot Implementation Plan for the US 93 corridor between Wickenburg and Kingman. The content of this report presented scenarios for demonstration and eventual

deployment of Mayday technologies, describing the activities associated with each scenario. The Implementation Plan was the first opportunity to consider in an organized fashion, the activities and costs necessary to support such concepts, such as ongoing operations and maintenance. Its contents describe solutions to stated users' needs together with deployment scenarios.

Task 7 Mayday Statewide Plan Outline

This task required coordination of the results garnered from previous tasks and integration with the existing Arizona ITS Statewide Strategic Plan. By considering all ITS deployments throughout the state, Mayday implementations could be prioritized for specific areas that would initially benefit the most, with a phased in approach for statewide roll-out of a comprehensive and seamless Mayday system. To accomplish this, candidate highway corridors with specific characteristics lending themselves to Mayday implementation were identified for future statewide expansion of the US 93 pilot deployment.

All ADOT and DPS District offices were contacted for their perceived Mayday corridor nominations to be based upon the following statewide criteria:

- lack of adequate communications (including cellular) along the corridor;
- lack of agency resources for full-time patrolling
- frequency of accidents; and
- lengthy accident detection, notification, or response times.

The statewide plan outline with candidate highway corridors highlighted is presented in Figure 2, on the following page.

Task 8 Final Report Preparation

This task summarized the Mayday project activities, and it provides ADOT and partner agencies with an overview of the project, and its outcomes. The supplemental materials completed as part of this task include a review of the research methodology, findings, conclusions, and recommendations, and the preparation of a Transportation Research Board paper.

Task 9 Mayday Project Summary Presentations

Within this task, the project team prepared a detailed presentation of the previously prepared Implementation Plan, Statewide Plan Outline, and other findings and analyses. This presentation was directed to the key corridor stakeholder agencies. Such presentations were intended to play a critical role in forming opinions among the corridor community as to the technical feasibility and potential benefits of Mayday implementation along the US 93 corridor.

Task 10 Research Council Executive Presentation

This task required a presentation of all Mayday research findings and recommendations to the ADOT Research Council.

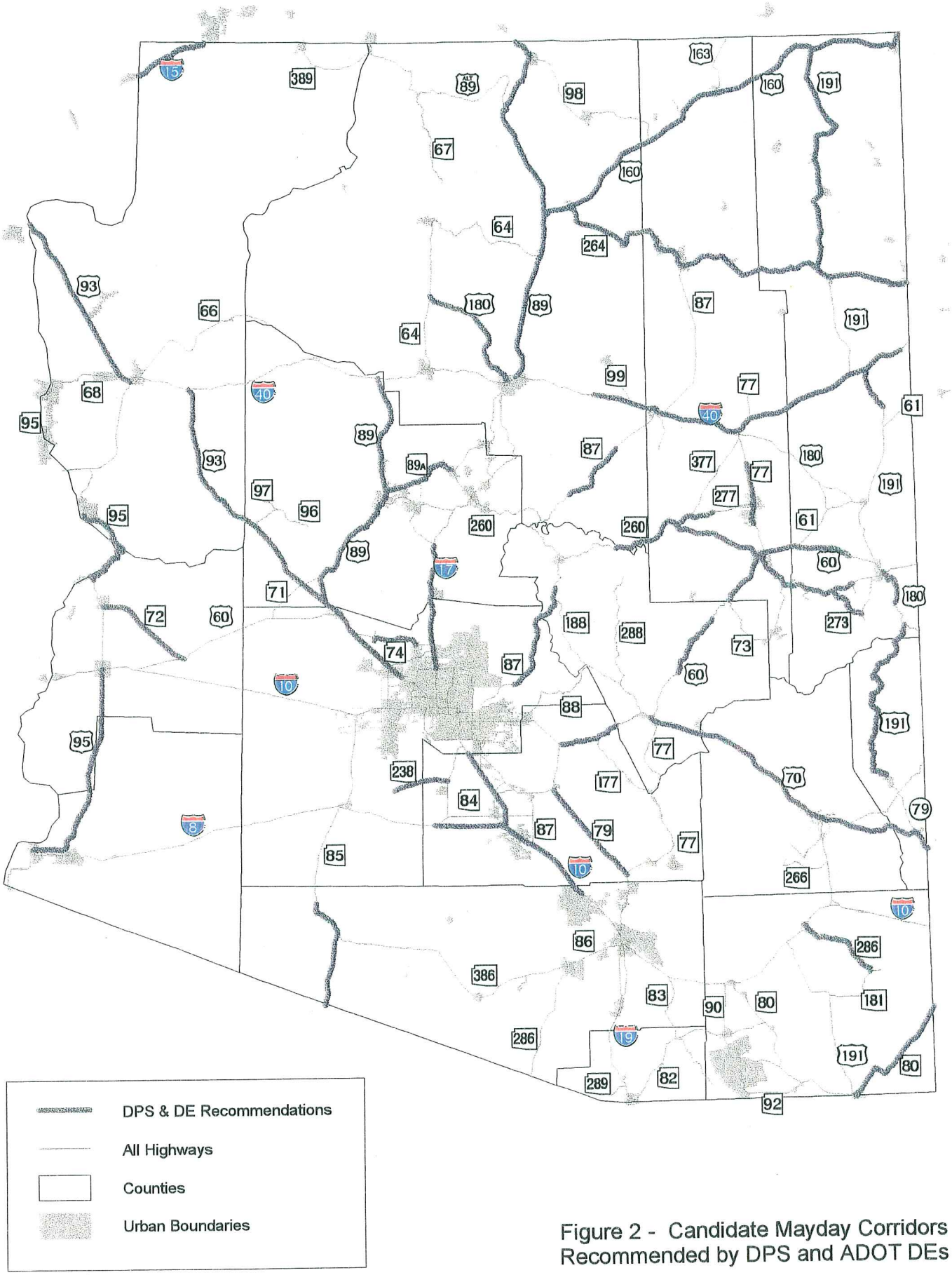


Figure 2 - Candidate Mayday Corridors Recommended by DPS and ADOT DEs

5. MAYDAY RECOMMENDATIONS

The US 93 Mayday recommendations address numerous challenges identified by the corridor stakeholders, and were unanimously agreed upon by the Mayday TAC. The three-pronged recommendation consisted of:

- A Motorist Assistance Patrol;
- A CVO Corridor Watch Program; and
- Emergency Satellite Telephones.

These recommendations meet the greatest number of highway users needs with no requirement that individual motorists invest in in-vehicle technologies. Detailed approaches, more refined costs, and program specifications for the Mayday recommendations were presented in the Technical Memorandum 5 – Mayday Pilot Implementation Plan. The following are brief descriptions of the recommendations.

5.1 MOTORIST ASSISTANCE PATROL

In many parts of Arizona, DPS does not have the resources to patrol 24 hours a day. Also, law enforcement activities must always have the highest priority for DPS officers with motorist assistance being a secondary priority. Enforcement tasks, such as handling a "driving under the influence" case may require the officer to be off the routine patrol of the corridor for several hours. This absence from the corridor led to the determination of a need to augment DPS patrols with a dedicated motorist service patrol.

The concept for this first Mayday test deployment option is to provide a motorist assistance patrol that services the US 93 corridor between SR71 and I-40 (approximately 91 miles). Motorist assistance patrols (MAP) have proven to be very effective in other states. On rural highways, they significantly lessen the burden placed on PSAPs by decreasing the number of calls relative to mechanical, out of fuel, and other travelers problems not requiring police, fire, or emergency management resources.
The purpose of the MAP is to serve stranded motorists and to facilitate getting appropriate emergency management personnel to accident scenes in a more efficient manner. MAPs will be able to provided enhanced accident identification and notification to enforcement and safety professionals along the corridor. The patrol drivers' familiarity with the corridor, their knowledge of mileposts to determine location, and their ability to contact ADOT maintenance or PSAP dispatch will contribute to greater and more efficient safety management on US 93. The MAP will be implemented to assist motorists in distress, improve response time to motorists in need, improve traveling safety, mobility, and efficiency along Corridor, and enhance public perception of ADOT.

The proposed MAP will operate on US 93 between SR71 (milepost 183) and the I-40 junction (milepost 91). Patrols will require a minimum of two ADOT employees, with one vehicle, 7 days a week, from 11pm to 7am. Specifics on staff training, program administration, and vehicle equipment were presented in the project Technical Memorandum 4.

Numerous other state departments of transportation have successfully implemented MAPs utilizing in-house personnel or outsourcing the public service. The feedback has been overwhelmingly positive for other sites, creating interest in implementing a program on the US 93 corridor.

The TAC determined that this recommendation would benefit the corridor in a number of areas and would be cost effective. The estimated total cost for a 6 month trial implementation of a MAP on US 93 is $132,000.

5.2 COMMERCIAL VEHICLE CORRIDOR WATCH PROGRAM

The concept for this second Mayday pilot deployment is to facilitate partnerships with the commercial vehicle and tour bus industry for a Corridor Watch program. The purpose of developing a public/private partnership with the commercial vehicle and tour bus industries is to develop better coverage along the corridor for incident identification and notification. There are a number of commercial vehicle operations (CVO) that dispatch trucks along the US 93 corridor. According to the American Trucking Association (ATA), 60% of the major trucking companies now are deploying GPS with satellite communications in their vehicles in support of computer aided dispatching (CAD) and automatic vehicle location (AVL). These vehicles are equipped with two-way communications with their fleet dispatching centers and are capable of transmitting reports on incident sightings along with their location. Furthermore, many of the drivers also have cellular capability and are capable of initiating a 9-1-1 call to the PSAP where cellular coverage exists. The commercial vehicle drivers are trained professionals and understand the corridors on which they travel. They have proven to be very helpful over the years in helping to save lives at major accidents.

Casino and other tour service buses also travel this route. The management of the casinos have expressed an interest in providing improved travel safety on their buses as an incentive to attract more visitors. Adding AVL and satellite communications to their vehicles which provides them with a real-time Mayday capability meets their traveler safety objectives. Thus, the tour company and casino buses are another possible partner.

These routine drivers of US 93 are always familiar with their location along the corridor and are excellent resources to emergency management personnel. The drivers of commercial vehicles and tour buses can utilize their in-vehicle radio or cellular communications to contact their dispatchers, who in turn would contact the local PSAP operator when a stranded motorist or accident is witnessed. If the drivers only have

communications access to contact their own company fleet manager/dispatcher, that dispatcher can contact the appropriate PSAP operator to deploy assistance to the incident site. Performance of the Corridor Watch program would be measured by the number of both single and duplicate calls made for incidents spotted along US 93. Many times there are several calls for the same incident, but similarly there are also incidents that are not called in.

The CVO Corridor Watch program will document the calls made by the participating commercial vehicle and tour bus drivers or dispatchers to facilitate an evaluation that measures the success of such a Mayday endeavor. The objective of this Mayday recommendation is to provide greater coverage for incident identification and notification, with the CVOs and tour buses serving as probes throughout the length of the US 93 corridor. The estimated cost is $108,000 for a 6 month trial period.

This recommendation would require a public/private partnership and both intra and inter-agency coordination with ADOT serving as the lead agency. The TAC felt that this cooperative, cost-effective method of involving commercial highway users would benefit all travelers on the US 93 corridor.

5.3 EMERGENCY TELEPHONES

The concept for the third deployment option, emergency telephones, has been well received in other states; however, the value of emergency telephones is being reduced as a larger portion of our population acquires cellular service. Recent statistics indicate that 26% of the population now have cellular telephones; however, on US 93 there are long stretches that do not have cellular coverage. This is particularly true for the less powerful hand-held phones that are common today. Agency FM radio coverage is also very poor in many of these areas. It is in these areas along the corridor with poor to non-existent communications coverage that this pilot deployment plan proposes to establish five satellite telephones, which will be considered as Emergency Telephones. The locations recommended for installation of emergency telephones are:

- Milepost 136.78 southbound , South of Kaiser Springs
- Milepost 142.58 or at the Burro Creek Lookout
- Milepost 145.94 southbound, North of Nothing, Arizona
- Milepost 149.23, in the vicinity of Nothing, AZ
- Milepost 153.58, near the Highway 97 (Bagdad) junction

See also Figure 3 on Page 18.

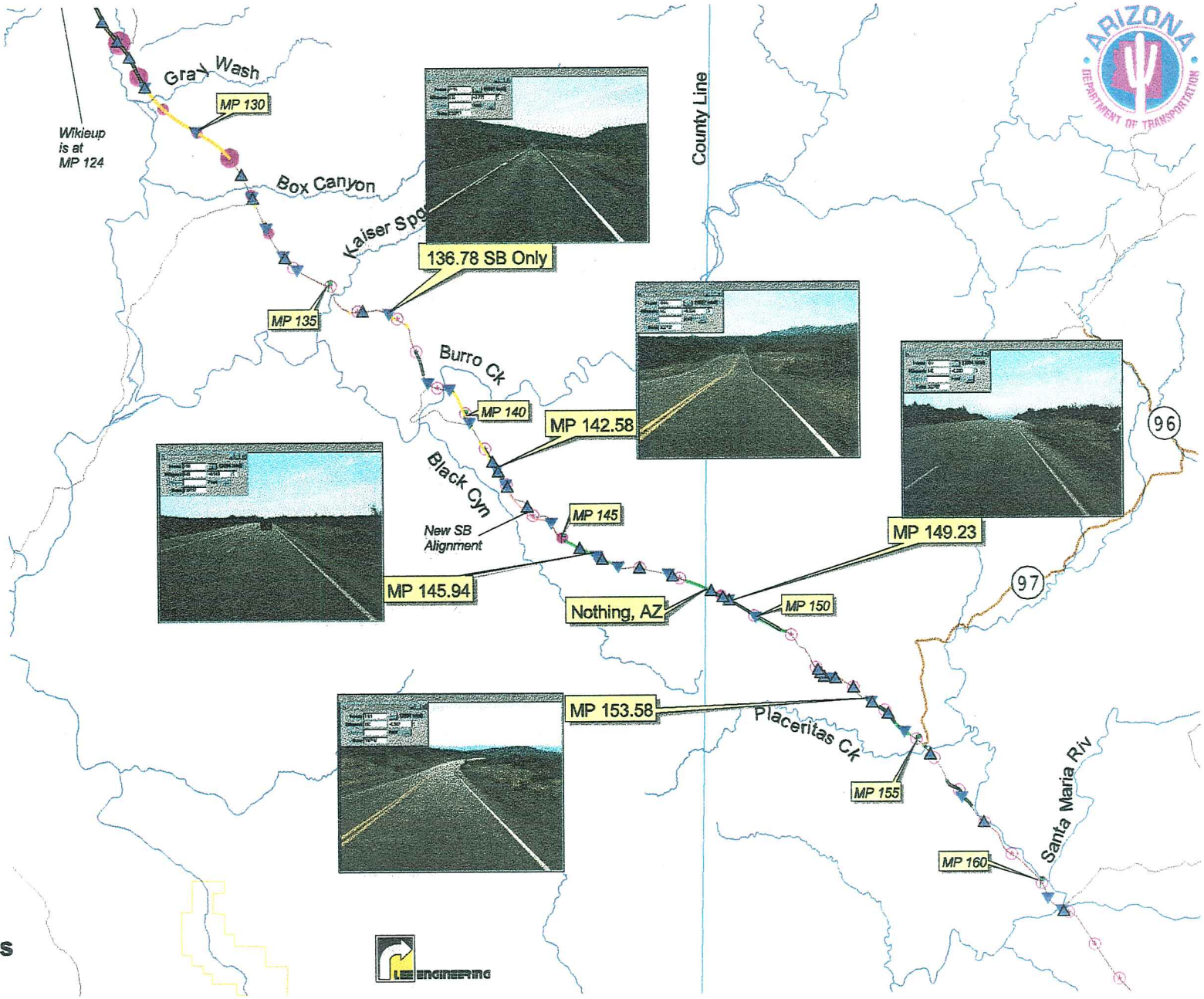
The potential sites along US 93 between milepost 135 and milepost 155 were selected according to the following subset of criteria:

Criteria 1: Existing Shoulder wayside (minimize cost)
Criteria 2: Waysides for both NB and SB very close to each other (to always facilitate stopping clearance for each direction of travel)
Criteria 3: Straightest sections of roadway (maximize advanced visibility to traffic)
Criteria 4: 5 potential sites roughly 4 miles from each other (to cover the specified length of roadway). Even spacing is desired to accommodate user expectations.

Placement of the emergency telephones utilizing satellite technology at sites with weak to non-existent cellular coverage allows all drivers, whether they own a cellular phone or not, to utilize this roadside resource. The placement of emergency telephones provides an opportunity for travelers seeing an accident or a stranded motorist to telephone for help sooner than is currently possible given the remote characteristics and the lack of telephones or other facilities along the corridor.

This recommendation was widely supported by the TAC as a broad, cross-cutting solution to the limited communications available along the rural corridor. The estimated project cost to implement the emergency phone component of this Mayday research project for a 6 month period is $129,000.

US-93 Emergency Phone Locations



6. CONCLUSIONS

The Mayday project approach and the resulting recommendations were customized to meet existing emergency response and safety challenges on US 93. The project outcome has provided ADOT and its partner agencies with a deployment strategy that can benefit all agencies and organizations operating on the corridor.

The recommendations of a motorist assistance patrol, corridor watch program, and emergency telephones address several of the most critical issues identified by the local enforcement professionals, emergency response personnel, and other highway users along the US 93 corridor. Total program costs for this three-pronged approach to implementing a 6 month test deployment on US 93 are estimated at approximately $369,000. These costs include program facilitation, deployment and an evaluation program.

Project Title	**Total Cost**
Motorist Assistance Patrol	$132,000
Corridor Watch Program	$108,000
Emergency Phones	$129,000
Total	$369,000

Table 3. Rural Highway Mayday Total Program Cost for Trial Deployment

On a statewide basis, the Arizona highway system poses many emergency response, public safety and personnel resource challenges to covering the vast remote rural areas. Both ADOT District Engineers and DPS enforcement personnel identified critical locations throughout the state for possible future implementation of the Mayday recommendations (see Figure 2, state highway system map).

The next steps towards implementation of these recommendations will require continued coordination and commitment among the participating emergency management, law enforcement and transportation professionals, in order to enhance safety and accessibility to emergency services throughout the study area.

In particular, ADOT and DPS must identify and empower champions for those concepts to pursue funding and partnerships for deployment.

APPENDIX

APPENDIX A

The following stakeholder agencies were represented on the project 's Technical Advisory Committee (TAC):

Arizona Automobile Association (AAA) –
Dixie Richie, Cydney DeModica

Arizona Department of Public Safety -
Kingman Patrol District - Lt. John Tibbetts
Western Air Rescue-Ranger 33 - Mike Mickelson

Kingman Regional Medical Center –
Sue Kern

Mohave County Sheriff's Office –
Greg Smith

Arizona Professional Towing and Recovery Association –
Dave Clement

Arizona Department of Administration – *State 9-1-1 Office* -
Larry Beauchat

Maricopa County Department of Transportation / Phoenix Fire Department -
Chuck Manuel

Federal Highway Administration –
Jessie Yung, Jennifer Hoaas

Arizona Department of Transportation –
Transportation Technology Group, Phoenix TOC- Dottie Shoup
Kingman District - Debra Brisk, Jennifer Livingston, Jim Fountain, Ken Paetz
Prescott District - Bob LaJeunesse
Technology Information Resources - Jack Petersen
Transportation Technology Group / ENTERPRISE - Manny Agah
Arizona Transportation Research Center - Steve Owen